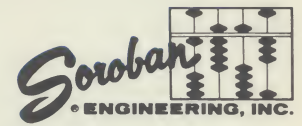
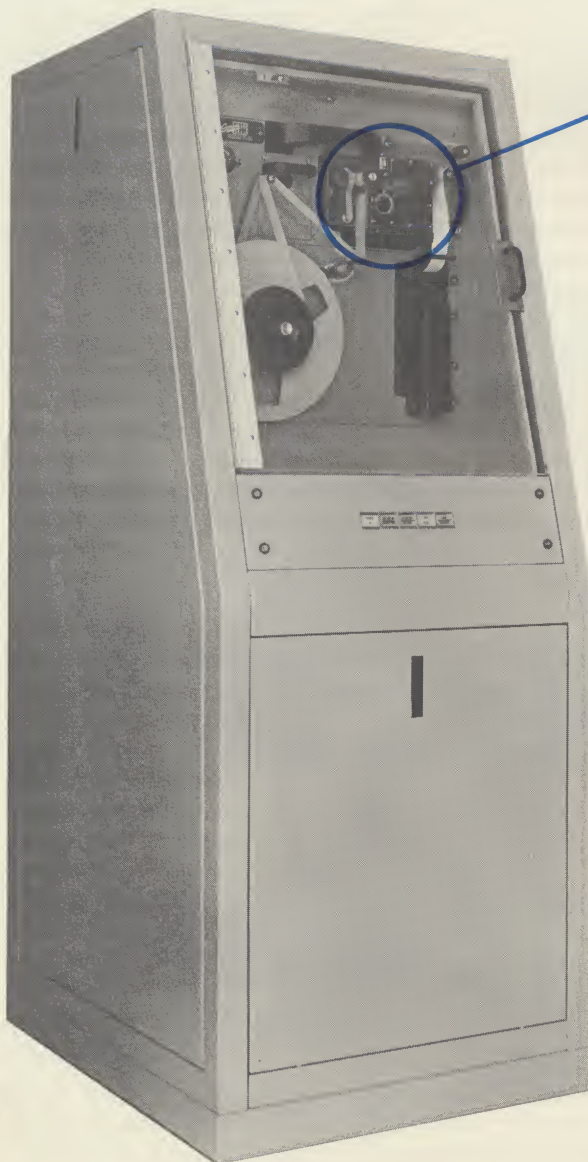


# MODEL GP-2 CON WITH FFR POST PUNCH CHECK READ STATION



GP-2/FFR Punch Reader

GP-2 CON with FFR Reader



## GENERAL

The Soroban Model GP-2 CON with FFR reader is a self-checking high-speed tape punching system which may be readily interfaced with any computer or data transmission system. Input 5 to 8 bit codes are accepted for recording bit parallel and code serial. The console contains a two-code buffer store to permit recording of asynchronous data at any rate up to the full operating speed of 300 codes per second. The FFR check reading station is located two code positions downstream from the punching station. An additional three-stage buffer stores the desired punched data for comparison with readings made by the post punch reading station. A non-comparison provides an error indication and inhibits further punching.

Upon indication of an error, the character which would have been recorded is displayed on a bank of eight lights while the character which was read from the tape is displayed on an adjacent bank of indicator lights.

The tape punch and reader are panel mounted in a slope front rack complete with tape handling facilities, control panel, power supplies, and solid state buffer and control circuitry.

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## GP-2 PUNCH

The GP-2 is a tape perforator designed to accurately and reliably record data in standard tape at speeds up to 300 characters per second. The unique design of the GP-2 punch has resulted in a rugged, long lived, maintenance free, high speed unit.

In the GP-2, reciprocating motions for cycling both the tape-feed and punching operations are derived from a pair of constant diameter three-lobe (triangular) cams driven from a constant speed rotational power source. Enclosing "U" shaped cam-followers whose parallel sides maintain contact with the opposing sides of the cams during cam rotation generate the punch's positive displacement cyclic drive motions. When the camshafts are driven at a constant speed, the cam-followers become stationary at the extremes of their cyclic strokes for one-sixth of each camshaft revolution. During these dwell intervals, the feed and punching loads are selectively coupled or uncoupled from their respective followers. The relative phasing of the cams, which are operated in an oil splash bath, is established by a toothed drive belt between them.

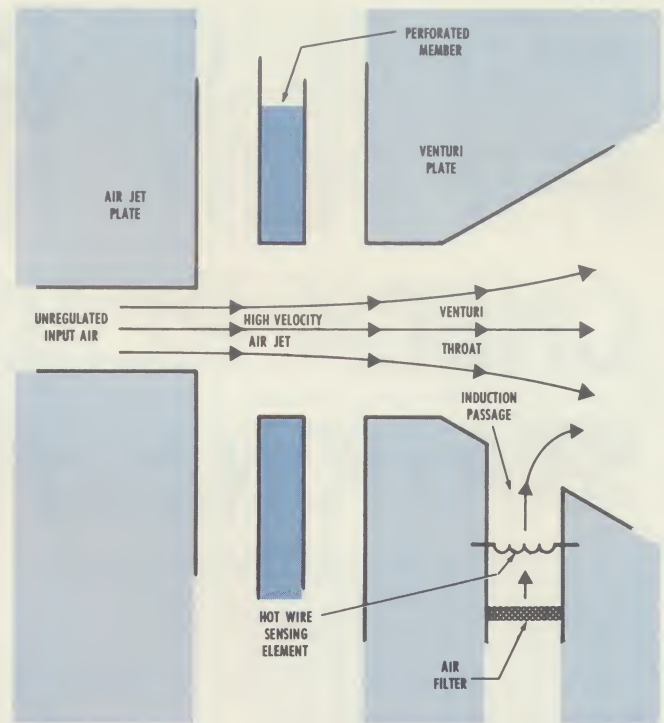
The three lobe cam systems permit generation of reciprocating motions free of resonance effects so common to spring-loaded cam-followers operated at high speeds. Drive power required to overcome forces exerted by the follower springs encountered in the more common spring-loaded cam-follower systems is not expended by the GP-2's cam systems. Positive following is maintained throughout the complete punch operating cycle. In addition, the dwell intervals produced by the three-lobe cams eliminate the impacts and adjustment instabilities which are encountered when coupling and decoupling comparable feed and punching loads to the more common sinusoidal drive sources.

Punch pin selection and tape feeding are each controlled by magnet pairs (MARK-SPACE) for selection and reset. The design provides high speed control coupled with the elimination of return springs which have inherent unpredictable resonant effects. The correct drive circuits and appropriate timing are provided by the console buffer and control circuitry.

## FFR READER

The FFR series of tape readers was designed for accurate and reliable high speed reading of virtually all punched tape media by a reader insensitive to the media being sensed. Character-by-character reading of punched tape, both thick and thin, opaque or transparent, may be performed at speeds up to 300 characters per second.

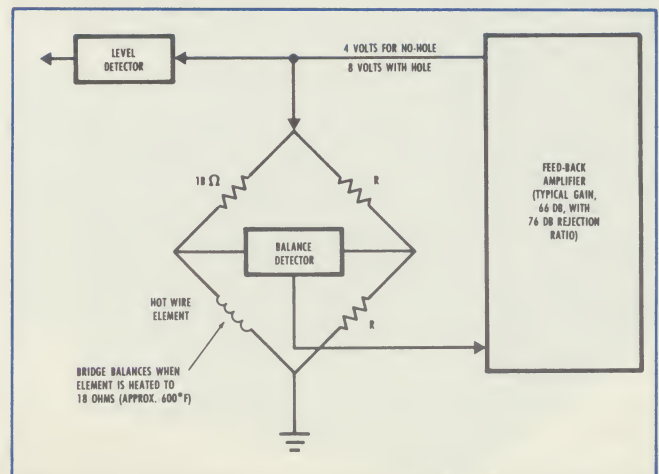
Fluid-flow sensing of a perforated tape involves passing the tape in front of high pressure air jets positioned in correspondence with the hole pattern of the tape to be sensed. The jets are supplied with filtered but unregulated air from a simple multi-vane positive displacement air pump. As the tape is transported across the file of jets, the tape acts as a valve, porting air wherever a perforation is present and blocking or deflecting the air flow whenever continuous tape is encountered. A correspond-



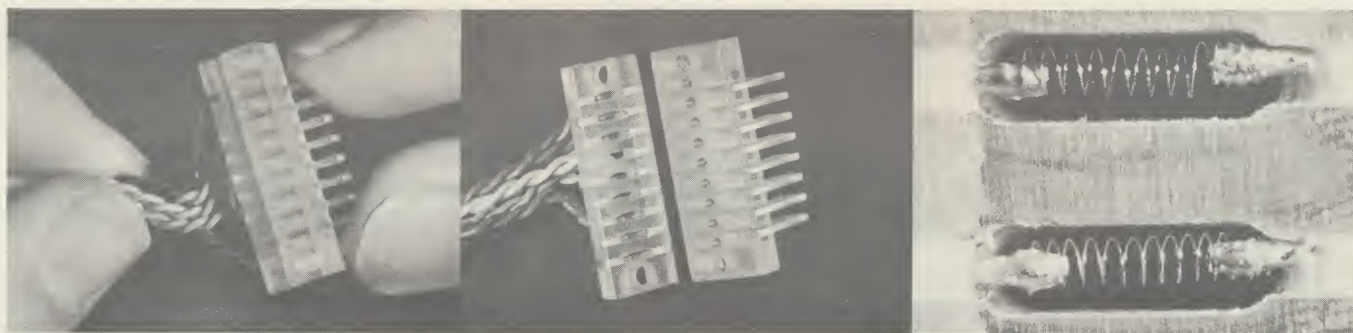
Fluid-Flow Sensing Station

ing series of apertures on the opposite side of a gap directs ported air into a Venturi throat. The Venturi's induction air-flow draws additional air through an induction passage, through an air filter, and over a hot-wire sensing element wherever the tape permits the air's entry into the Venturi. Each hot-wire sensing element is wired as one leg of an electrical bridge circuit. Individual feed back amplifiers associated with each bridge maintain the bridge in balance. Air flow which would normally tend to cool the element and cause bridge unbalance, produces an error signal which, when amplified, permits the feedback amplifier to adjust the bridge drive and retain balance. Thus the element is maintained at constant resistance, hence constant temperature. The voltage across each bridge indicates when the tape has ported air over its associated anemometer hot-wire element. Tape opacity or transparency is of no consequence since operation of the system is based entirely on air flow through the tape.

Fluid-Flow Sensing Circuit







Venturi Plate Assembly

The reading elements of the FFR Readers consist of several coils of iridium wire. The elements have a usable temperature range of up to 1500°F. To insure a life measured in thousands of hours of operation, the element operating temperature is restricted to 600°F. A fluid-flow sensing element measures approximately 7 ohms at room temperature and 18 ohms at 600°F. operating temperature. The amplifiers produce bridge balance with 4 volts for the no-hole condition, 8 volts for the hole condition. The amplifiers are sensed just before advancing the tape at the GP-2 punch 285° timing pulse.

## CONSOLE WITH BUFFER CIRCUITRY

Consoles are available utilizing the GP-2 High Speed Punch and FFR read station for the recording and verification of digital data. This cabinet enclosed unit is complete with all required power supplies, buffering and drive circuits, tape handling facilities, and convenient manual controls.

All Soroban standard consoles are designed with a two-code buffer store which permits recording of asynchronous data at any rate up to the full speed of the punch. This console has an additional three stage buffer to store the data for comparison at the FFR read station. The following is a detailed description of the manual controls and interface signals. The generally acceptable "Ready-Strobe" method of interconnection is used for the recording of 5 to 8 bit codes.

## INPUT SIGNAL REQUIREMENTS

All Soroban standard punch consoles are designed to operate with negative polarity signal levels. The logic levels are:

Condition	Standard Level	Inverted Level
"0" bit or "OFF"	0 $\pm$ 0.5 V	-3.0 to -10 V
"1" bit or "ON"	-6.0 to -20 V	0 $\pm$ 0.5 V

The input signal lines consist of the following:

- 5 to 8 code lines
- Strobe (Data Present) line
- Select line (Remote Motor ON)
- Tape Feed, Remote
- Record Error Reset

Since the input code lines are sampled by the strobe pulse, their rise and fall times are not critical. However, the code levels must be settled at least 20 microseconds prior

to application of the strobe pulse, and must remain stable until at least 5 microseconds after the strobe has gone off. The strobe pulse must have a 50% width of at least 20 microseconds. The Record Error flip-flop and indicator may be reset manually or by a 20 microsecond pulse applied to the record error reset input line.

## OUTPUT SIGNALS PROVIDED

All Soroban standard punch consoles are designed to provide negative polarity signal levels. The logic levels are:

Condition	Standard Level	Inverted Level
OFF	+0 0 -0.5 Volts	-20 V with a 2.2K impedance
ON	-20 V with a 2.2K impedance	+0 0 -0.5 Volts

The output signal lines consist of the following:

- Buffer Ready
- Low Tape Warning
- Tape Trouble
- Record Error

**Buffer Ready:** This line should be used to control the input data rate. This line will be at -20 volts whenever the buffer is ready to accept data. The conditions which exist when this signal is provided are as follows:

- Punch is up to operating speed (usually less than 2 seconds after motor on).
- Unit is in On Line condition.
- No Tape Trouble is present.
- Tape Feed switch is not actuated.
- Input column of the storage register is empty and is not being reset.
- Record Error line Off.

The Buffer Ready line will rise to 0 volts approximately 2 microseconds after a data present Strobe pulse is applied and will stay at 0 volts until the input character is transferred to the second column of the storage register and the input column has been reset. As soon as the Buffer Ready line returns to -20 volts the buffer can accept another input character. The delay between successive characters will be determined by the punch timing and by the status of the storage registers. The delay can vary from a minimum of 20 microseconds to a



maximum of one full punch cycle. The Buffer Ready rise and fall times are of approximately 2 microseconds duration as measured at the console with interconnecting cables removed.

**Low Tape Warning:** This signal provides an indication when the tape supply reaches a preset level. As long as the supply is greater than this level, this line will be at -20 volts. When the supply reaches the preset level, the line will rise to 0 volts.

**Tape Trouble Warning:** This line provides an indication when any of the following tape trouble conditions are present:

1. Out of tape or broken tape from supply unit.
2. Tight tape from supply unit.
3. Broken or slack tape on takeup reel.

The Tape Trouble line will rise from -20 volts to 0 volts when any of these conditions are present and will remain at that level until the trouble is cleared. A trouble signal will also cause the Buffer Ready line to rise to 0 volts.

Out of tape is sensed by a contact on the punch panel. The system must be placed in the Standby condition before operating the Tape Feed switch and replenishing the tape supply.

A Tight Tape condition is sensed by a contact on the tape supply mechanism. If this condition occurs it may correct itself. If not, the system should be placed in the Standby condition and the tape supply mechanism examined. The fault is usually caused by improper loading of the supply roll, or by a damaged roll of tape.

A broken tape between the punch and takeup reel will allow the slack arm to hit the left hand bumper. Any movement of this arm against or away from the bumper will momentarily operate a contact to set the Tape Trouble flip-flop. The system will be placed off line until the Reset switch is operated. Thus the punch may be used with or without reeling the tape on the takeup reel.

**Read Error:** This line will normally be at -20 volts and will rise to 0 volts when the buffer detects a record error. A detect error will inhibit the Buffer Ready line. The Record Error line will return to normal after a manual reset or an input Record Error reset pulse.

## CONTROL PANEL

**Power ON-OFF:** This alternate action switch controls the main AC power to the console.

**Motor On/Operating:** The motor ON switch controls locally the AC power to the punch motor and accessory reel panel. The operating indicator will light Green when the punch motor has reached approximately 90% of its nominal operating speed. At this time the Buffer Ready line will also turn on if the system is in an ON-LINE condition.

**Standby/On Line:** This alternate action switch controls the recording status of the punch console. The console should be in Standby for tape loading and unloading and to enable the local tape feed switch. The console must be in the On/Line condition to enable the Buffer Ready line and allow the console to accept data.

**Record Check Disable:** This is an alternate action switch to allow the disabling of the FFR reader comparison circuits.

**Record Error (Reset):** This is an indicator for a Record Error, and a momentary switch for the resetting of the error indicator.

**Tape Feed:** This momentary action switch is used to advance tape through the punch with sprocket holes only punched.

**Low/Trouble (Reset):** This is a split indicator to show a low tape supply and/or a tape trouble condition. Operating the momentary action switch will reset the Trouble indicator after the trouble conditions have been cleared.

**Code Display:** Consists of two sets of 8 lights each which will display the last code read by the FFR reader and the punched codes as specified by the buffer shift register.

## QUICK REFERENCE DATA

Operating speed, asynchronous recording of up to 300 codes per second.

Code characteristics, 5, 6, 7 or 8 hole tapes.

Tape and Hole Dimensions as per EIA Proposed Standard RS-227:

Feed Hole Diameter - .047 - .001 inches  
+.002  
+.001

Code Hole Diameter - .072 - .002 inches  
Center of feed hole to guide edge of tape -  
.392 ± .003

Tape widths - .687, .875 or 1.000 inch all with  
±.003 tolerance.

Accumulated error ±.005 inches in six inches of tape.

Tape supply - standard 1000 ft. (8" dia) rolls on 2" cardboard core.

Tape reel, NAB, 4" I.D., 10" O.D., 1000 ft. capacity of standard .004 inch thick tape.

Punch head service schedule, 2500 one thousand foot rolls of dry paper tape minimum or 6000 rolls of oiled paper tape, or 1000 hours of operation, whichever occurs first.

Punch head synchronizing signals into 1000 ohm load.  
6 volts peak-to-peak  
250 microseconds duration  
Timing adjustable for maximum and reduced speeds.

Interlock safety features:

Tight tape	Slack arm or broken tape
Out of tape	Low tape

Size - Approximately 63 inches high, 29 inches deep, 24 inches wide.

Weight - Approximately 600 lbs.

Power - 115 VAC, 1 phase, 60 cycles 0.8 KW, 15 ampere service recommended.

Operating temperature range - 0 to 60° C.